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(54) IMPROVEMENTS RELATING TO EXCAVATING DEVICES

(71) We, ESCO CORPORATION, a body organized under the laws of the State of Oregon, in the United States of America, of 2141 Northwest 25th Avenue, Portland, 5 Oregon, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the 10 following statement:

This invention relates to excavating devices and more particularly to replaceable edge parts for tooth assemblies therefore, and to said tooth assemblies comprising replaceable edge parts and holders for the said edge parts.

It is an object of the present invention to provide a said tooth assembly which does not require a key or the like for retaining the edge part in or on its holder.

According to a first aspect of the invention, a replaceable edge part for an excavating device comprises a unitary body having a ground engaging edge at the front end thereof, said body having a longitudinal axis extending from the front end to the rear end and along which said edge part is moved when being installed on an edge part holder, said body adjacent the rear end being equipped with faces adapted to mate with corresponding faces on said edge part holder, said body faces each extending generally longitudinally of said body and being convergent longitudinally of said body, each of said body faces having a plurality of parallel longitudinally extending spaced part grooves therein, all of said grooves having substantially identical cross-sectional dimensions for at least one-third of their length, and each of said grooves being defined by side walls, in the area of substantially identical cross-sectional dimensions, which side walls each form an obtuse angle with the bottom of the groove and diverge from each other as they extend from the bottom of the groove.

According to a second aspect of the invention, a replaceable edge part according to the said first aspect of the invention is pro-

vided in combination with an edge part holder therefor, said edge part holder being equipped with flutes on the said corresponding faces engaging the side walls of the said grooves in the said body faces, the said combination defining a tooth assembly

Since the advent of the two-piece excavating tooth comprising a point attached to an adaptor at least as early as 1900, there has been a continuing problem with locking the point securely on the adaptor by means of a key. If the lock was so secure as to completely insure connection under all types of digging, it was virtually impossible to replace the wearable point on the adapter. On the other hand, if the lock were easily releasable, there was always the possibility that the key would become removed during harsh digging with the attendant loss of the point. This would leave the adapter exposed, requiring expensive and extensive repairs to any bucket, dipper, etc., which carried the excavating tooth.

By use of the present invention, we avoid the need for any locking key, instead making use of mating parts on the pieces of the excavating tooth.

The invention is illustrated by way of example in the accompanying drawing, in which—

FIG. 1 is a perspective view of an assembly edge part and edge part holder combination embodying the invention and defining 80 excavating tooth assembly;

FIG. 2 is a perspective view of the components of FIG. 1 shown in disassembled condition; and

FIG. 3 is an enlarged sectional view such as would be seen along the sight line 3—3 in FIG. 1.

In the illustration given, the numeral 10 designates generally an excavating tooth assembly which is seen to include an adapter or edge part holder 11 and a point or edge part 12. The point is considered the wearable or replaceable portion and is the part that engages rocks, gravel, etc. principally

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through its cutting or digging edge 13. Generally, the point 12 has a hollow-wedge shape with a socket 14 (see FIG. 2) opening to the rear of the point 12.

5 The adapter 11 is constructed to be mounted on the forward edge of an earth-handling device such as a dragline bucket or shovel dipper and for that purpose has a key receiving opening 15. From forward shoulder-providing faces 16, the adapter 11 has a pair of noses 17 and 18 separated by a discrete space or recess 19 in which a web 20 longitudinally bisecting the socket 14 is received.

10 15 The essentially corrugated or fluted nature of the interior of the socket 14 and wedge faces of the noses 17 and 18 can be appreciated from a consideration of FIG. 3. In FIG. 3, it will be seen that a plurality of substantially identical longitudinally extending ribs 21, 22 and 23 are provided on the upper wedge face of the nose 17 to form flutes. Identical ribs are provided as at 24, 25, and 26 on the lower wedge face of the nose 17. In the illustration given, the nose 18 is similarly equipped. As a specific example of the invention, the tooth pictured may be a 4.5" nominal size wherein this dimension is essentially the transverse dimension of the nose assembly, i.e., the dimension ranging from the right-hand side of nose 18 to the left-hand side of nose 17. In such a case, the pitch P dimension is 0.5", the valley is 0.12", the root spacing S is 0.06", and the overall engagement height R of a rib and groove is 0.31" (Figure 3). It will be seen that a plurality of convergent planar faces are provided on grooves and ribs of each nose and socket so as to provide a substantial frictional engagement between the point and the adapter.

In use, the stresses encountered usually have a substantial component extending rearwardly along the mid-longitudinal plane of the assembled tooth which tends to drive the point more securely into seating engagement with the adapted noses. Because the ribs and grooves on each of the noses and the sockets are substantially identically oriented, this provides a maximum of frictional bearing so that it is extremely difficult to remove the point from the adapter. In practice, it has been found that even making use of a sledge hammer and drift pin to apply force in the direction designated F in FIG. 1 is inadequate to remove the point from the adapter. Removal, however, is facilitated by virtue of relieving a portion of the upper face of the point as at 27 for the insertion 40 of a wedge-type drift pin (not shown). A wedge inserted into the relief 27 bears conjointly against the web 20 and wall 28 defining the rearward extent of the recesses 19 so that tremendous dislodging forces can

be applied with a relatively small force applied to the wedge-type drift pin—thereby facilitating disengagement of the point from the adapter.

It should be appreciated that the present invention makes possible the elimination of any locking key as the means for holding the point and adapter in engagement after they have been properly joined. However, in some cases, the locking key can be used to advantage. For example, a small tooth point could be very easily installed with a 2-pound hammer, and no locking key is necessary. At the other extreme, where a 200-pound point is applied to a 13" nominal size tooth, it is quite obvious that a 2-pound hammer would not have sufficient weight to provide the degree of impact that is necessary to overcome the inertia of the tooth point. Thus, unless the artisan went to approximately a 150 to 300-pound sledge hammer, it would be impossible adequately to lock the components in place. In the extremely large tooth points, it will usually be necessary to install the tooth point and hold it in place with a locking key—using the power of the shovel or dragline to push the tooth point against the rock in order to properly accomplish the initial installation. From this, it can be seen that there can be no holding power attributed to the fluted bearing surfaces unless a sufficiently high bearing load is in existence.

From the foregoing, it will be appreciated that the degree of holding power will also depend upon the stresses encountered. Normally, very small teeth are subjected only to small stresses hence only limited bearing is needed.

In the illustration given, it will be noted that the flutes on the noses 17 and 18 extend substantially the length of the respective noses. However, those skilled in the art realize that the fluted bearing surfaces at the tip of the nose may not be sufficiently large to keep bearing loads at a safe level under heavy beam-bending loadings. Therefore, so as to avoid the peening or crushing of various flutes, it may be desirable in some instances to terminate the flute short of the nose tip. This can be done by making a partial flute which starts as a full flute at the rear of the nose and fades out to a flat continuous bearing surface at the tip of the nose. In this manner, the locking power is concentrated in the rear third of the nose area, providing maximum bearing surface where it might be needed.

The invention can be embodied in a variety of ground-engaging devices, effecting a secure connection between the edge part, such as a point, trencher, shroud or the like, and the associated edge part holder, such as an adapter wing, or the like.

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WHAT WE CLAIM IS:—

1. A replaceable edge part for an excavating device comprising a unitary body having a ground engaging edge at the front end thereof, said body having a longitudinal axis extending from the front end to the rear end and along which said edge part is moved when being installed on an edge part holder, said body adjacent the rear end being equipped with faces adapted to mate with corresponding faces on said edge part holder, said body faces each extending generally longitudinally of said body and being convergent longitudinally of said body, each of said body faces having a plurality of parallel longitudinally extending spaced apart grooves therein, all of said grooves having substantially identical cross-sectional dimensions for at least one-third of their length, and each of said grooves being defined by side walls, in the area of substantially identical cross-sectional dimensions, which side walls each form an obtuse angle with the bottom of the groove and diverge from each other as they extend from the bottom of the groove.

2. A part as claimed in Claim 1, wherein the grooves are parallel to the direction in which said edge part is moved when being installed on the edge part holder.

3. A part as claimed in Claim 1 or Claim 2, wherein said faces are upper and lower forwardly convergent surfaces defining a socket in the rear of the edge part.

4. A part as claimed in Claim 3, wherein the socket is bisected by a web extending in a direction normal to the planes of said body faces.

5. A replaceable edge part for an excavating device substantially as hereinbefore described with reference to the accompanying drawing.

6. In combination, a replaceable edge part as claimed in Claim 2 and an edge part holder therefor, said edge part holder being equipped with flutes on the said corresponding faces engaging the side walls of the said grooves in the said body faces.

7. A combination of edge part and edge part holder according to Claim 6, wherein the holder is equipped with spaced noses equipped with the said flutes, the said body having a socket receiving the said noses, and a central web in the said socket positioned between the said noses.

8. A combination of edge part and edge part holder for an excavating device substantially as hereinbefore described with reference to the accompanying drawing.

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